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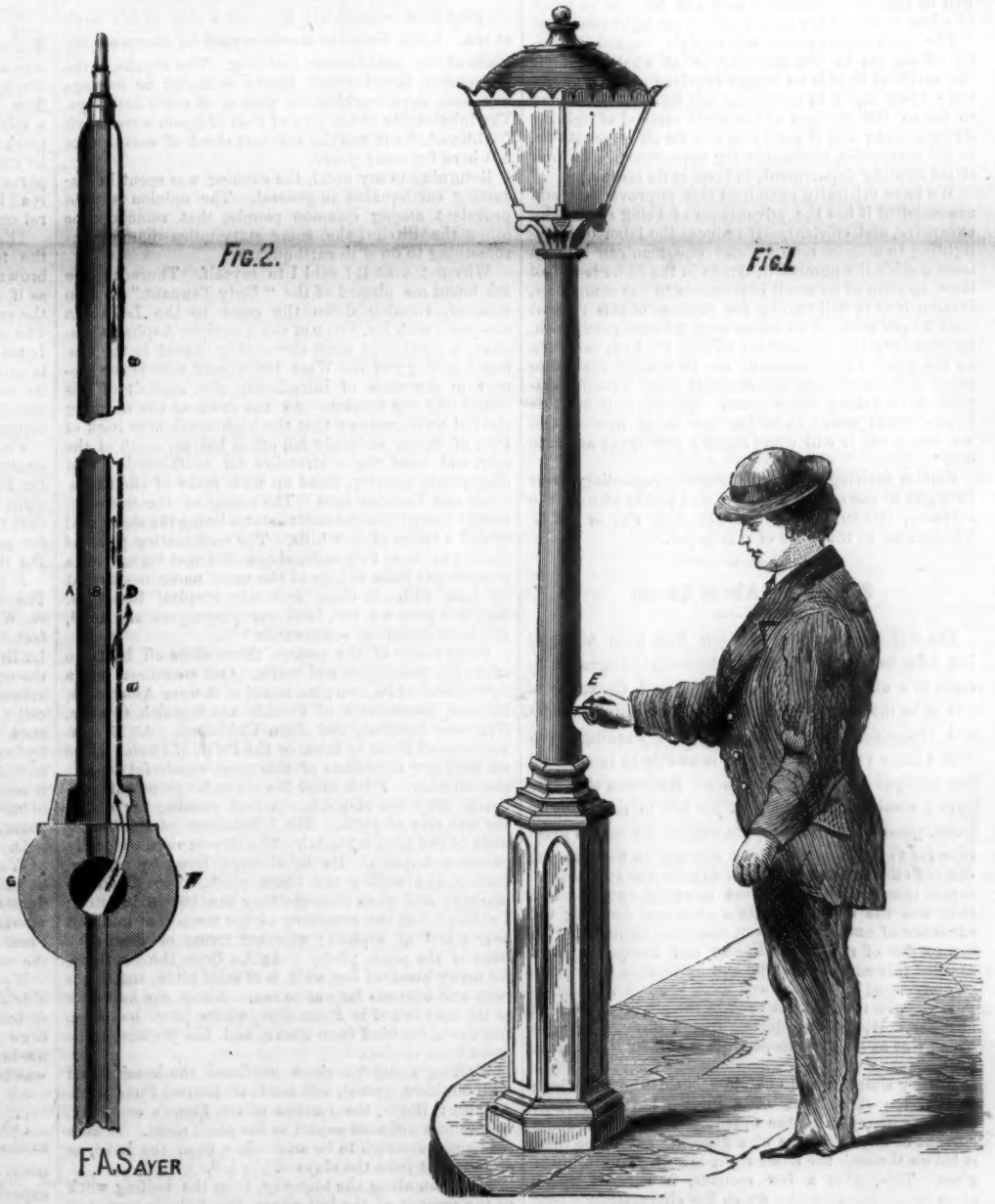
Lenox's Improved Mode of Lighting Street Lamps.

There has lately been patented an improved mode of lighting and extinguishing street, and other elevated gas lamps, which by its simplicity, labor-saving, and superiority over any other method yet brought before the public, must soon come into general use. Together with these long needed improvements, it possesses the great advantage of being lighted and extinguished from the pavement, without thrusting a torch into the lamp, or ascending to the same with a ladder, as is now done in this and other cities. The small opening noticeable in the body of the post (No. 1) is 2 inches by three inches in size, and is provided with a spring door. Immediately within this opening, and on the pipe is a cock which can only be turned with a key of a peculiar design, and different in each district or route. Thus placing the custody of the light within the control of the proper authorized parties. The lamp-lighter on coming up to the post, applies his key and light to the cock, when instantaneously, and almost without perception, the flame is conveyed to the burner, at any height. The most inexperienced person can light and extinguish the gas in any ordinary lamp post (by this method), about thirty times per minute. It has been tried under all circumstances in Philadelphia (where it is in use), and with great success. When we take into consideration how many lamps are nightly tampered with—lights turned out—gas left escaping—glass broken by the careless use of the torch—want of care in opening and closing lamp doors—the accumulation of dust within the lamp, clogging the burner, and a flickering uncertain light rendered by having the bottom left out (which is essentially necessary when the torch is used), the great value of the invention at once becomes apparent. Fig. No. 2. gives an enlarged bisected view of the pipe and cock, as applied to, and within a lamp post. The pipe is the ordinary three-quarter inch with a partition within it of the same thickness as



LENOX'S IMPROVED MODE OF LIGHTING STREET LAMPS.

the pipe, and running throughout the length of it from the cock to the burner; one side of this pipe is perforated with very small holes, a, a, a, a, about 1¼ inch apart. When the cock is turned halfway as in the figure, the gas rushes into the perforated side, and issues from these holes in minutely small quantities. A light being applied to the one at E, it is communicated from one to the other, until it reaches the burner. The draught of air from the door carries the flame up instantaneously; so very quick in fact is the operation, that the very instant the light is applied at the cock, it is seen at the burner, and the cock at the same instant being turned on full, the head of gas is taken from the jet side, and supplies the burner.

The lighting of street lamps in the ordinary way, involves a great amount of physical labor, which makes the process exceedingly slow and tiresome, and to a certain extent is doubtless injurious to the health of the lamplighter, besides being more than ordinarily a dangerous occupation.

The physical movements necessary to carry about a ladder on a run, as is generally done, placing it in position, and mounting it, together with the constrained motions required in turning on and lighting the gas, and getting safely down again to *terra firma*, is more varied, complex, and exhaustive in its nature, it is safe to assert, than any other occupation. When the hour for lighting street lamp arrives, it is essential that they be lighted as nearly simultaneously as possible, otherwise a portion of the town must remain in darkness, for a longer or shorter period, according to the number of lamps each individual lamplighter has in his district to light, and the celerity and despatch he employs in doing it.

If, to avoid the first inconvenience of tardy lighting, the lamplighter commences to light up his district an hour or more before night fall, a large amount of gas will be consumed uselessly, and will be just so much of a loss to either the people or the gas-light company.

The same observations will apply in regard to turning off the gas in the morning, or at whatever hour the artificial light is no longer required. Many efforts have been made to overcome the inconvenience, and to lessen the expense of the usual method of lighting street lamps; and it would be well for all corporations, or gas companies, contemplating improvements in their street lighting department, to inspect its merits.

We have critically examined this improvement, and are satisfied it has the advantages of being simple, inexpensive, and efficient. It reduces the labor of lamplighting to almost nothing, and one man can light at least double the number of lamps in the same length of time, an item of no small importance to gas companies, inasmuch as it will reduce the expense of this item at least 50 per cent. The lamps cannot be tampered with, because only the lamplighter having the key, can turn on the gas. The attachment can be readily applied to posts that are already set, at small cost, without displacing or taking them down. Taken all in all, this improvement seems to be just the thing needed, and we doubt not it will come rapidly into favor and into use.

Parties desiring further information regarding terms for right to use or manufacture, will please address the inventor, HIRAM LENOX, Philadelphia, Pa., or M. L. CALLENDER, at the office of this paper.

Something About Ozone.

The difficulty to obtain oxygen free from nitrogen has long been recognized by chemists. August Houzeau, in a number of experiments, found the cause of this to be the great attraction that exists between glass and atmospheric air. Long-continued washing, even with a large volume of oxygen, is unable to remove all the nitrogen from the glass tubes. Bunsen, a man who gave a considerable portion of his life to the study of gases, passed a current of pure oxygen through a glass tube for three successive days and nights without the desired effect; after the third day he was still able to detect traces of nitrogen in the escaping oxygen; and that was the cause of certain chemists' doubting the existence of ozone altogether, and confounding it with the oxides of nitrogen. Frémy and Becquerel have avoided this source of error and annoyance by a properly arranged apparatus, and have produced perfectly pure oxygen that did not contain the slightest trace of nitrogen. By passing electric sparks through this gas ozone was at once developed, giving all its characteristic tests.

A very simple way to obtain ozone is the following: Behind the short flame of a Bunsen burner a large beaker is placed, with the opening to the flame, and a current of air, by means of a glass or any other tube, is blown through the flame right into the mouth of the glass. This, after a few seconds, is covered with a glass plate, removing which the characteristic odor of ozone will be at once perceptible. Starch and guaiac paper will give a decided reaction.

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Editor—HENRY WURTZ.

American Chemical News.

[*Original Communication.*]

THE GREAT "PITCH LAKE" OF TRINIDAD.

[The following interesting letter from our esteemed contributor Dr. STEVENS, the Geologist, was written while on his way to his new gold-field on the Yuruari, in Venezuela; accounts of which he has already given to our readers (REPERTORY No. 14; of September 16, 1869; page 85).—H. W.]

TRINIDAD, June 10, 1870.

Professor HENRY WURTZ:

Dear Sir: We were sitting in the Club on the evening of the 8th inst., when at 8 P. M. there was a general rush for the door, some jumping down the area, and a scattering like sheep at the presence of the wolf. The cry of an Earthquake revealed the main spring of such sudden vaulting and leaping!

A low rumbling sound, as of heavy carriages passing a rough pavement, followed by oscillating movements of the earth and buildings, brought us suddenly into the presence of forces, more tremendous than we "dream of in our philosophy." Reaching the pavement, the feeling, to me, was that as if the earth were slipping from beneath my feet, like a ship in her lurch at sea. I was forced to steady myself by the trembling walls of the neighboring building. The shocks, three in number, lasted about thirty seconds; no damage was done, save cracking the plaster of some buildings. The inhabitants of the city of Port of Spain were much frightened, for it was the severest shock of earthquake felt here for many years.

Returning to my hotel, the evening was spent in discussing earthquakes in general. The opinion is quite prevalent among common people, that somehow or other the Pitch Lake, some sixty miles distant, has something to do with earthquakes.

Why not visit it? said I to myself. Thursday, the 9th found me aboard of the "Lady Tennant," an iron steamer, running down the coast to the Lake, in company with Dr. FIELD of the American Asphalt Company, a gentleman most thoroughly posted in the economic geology of the West Indies, and who is the pioneer in the work of introducing the asphalt of this island into our market. As the mists of the morning cleared away, we saw that the high rough hills back of Port of Spain suddenly fall off in height, south of the city, and then there stretches far southwards a vast champaign country, filled up with rocks of the Cretaceous and Tertiary ages. The rising of the mists revealed many beautiful sugar estates lining the shore, and inland a range of low hills. The culminating point of these was San Fernando, about 250 feet high, with a picturesque little village of the same name, nestling at its base, with its clean and tidy hospital buildings. Into this port we run, land our passengers and mail, and then steam on southwards.

From many of the estates there came off boats to exchange passengers and mails. Our steamboat was a little Babel of its own; on board of it were Americans, Britons, descendants of French and Spanish, Creoles, Negroes, Hindoos, and John Chinamen. At 11 A. M. we reached Point la Brea, or the Point of Pitch. Here we first saw the effects of this most wonderful asphalt phenomenon. Pitch lined the shore for shipment; the beach itself was of pitch. A reef running far out to sea was also of pitch. The foundations of the houses were of the same material. The streets were naturally paved with pitch. Its inhabitants lived by digging, boiling, and selling the black pitch, when fitted for market; and when they die they are buried in pitch; I noticed that the cemetery of the town was laid out over a bed of asphalt; whether living or dead they were of the pitch, pitchy. At La Brea, the headland, for many hundred feet wide, is of solid pitch, and forms reefs and barriers far out to sea. About one half mile to the northward is Point d'Or, where pitch has been run down the bluff from above, and has protected the point from erosion.

Walking along the shore we found the beach lined with boulders, gravel, and sand, all formed from pitch. At Point Boyer, the location of Dr. FIELD's company, we found a different aspect of the pitch point. It here seems not so much to be an outflow from the Lake, as an outburst from the clays of the hill.

A section along the highway, from the boiling work to the summit of the hill where the Lake is seen, 500 feet above the level of the sea, shows first some six or more feet of pitch at the water level, and beneath and above it lie eight to ten feet of clays and party colored marls, with ferruginous sandy masses. Near the surface of the first plateau is a bed of sea-shells, then follow clays mingled with pitch for some twenty feet to another plateau, where again sea shells are found; from thence on up to the summit of the hill, some 500 feet, clays mingled with "dead" and decaying pitch are to be seen. Along the road there is no sign of an overflow covering the surface as at La Brea, and in the road from La Brea to the Lake.

Dr. FIELD's road strikes the Lake at its west side, where he holds about one half of its area (the whole being 102 acres) by lease from the colonial government. Arriving at this point the Lake presents a bizarre appearance. The surface is flat, with innumerable flat islands of pitch, black and naked; at other times covered with a scanty growth of aquatic vegetation. Between each two diminutive islets of pitch there is a *sulce* of pitch filled with water; some of these sulcie can be stepped across, others are so wide one must wade if he would cross the Lake. From these islets the pitch-diggers pick it up for about a foot in depth. This shallow excavation is then abandoned. In rainy weather the pit soon becomes filled with water. In either case it soon rises up from the bottom; the cavity again becomes filled, and in a few weeks it may be again redug for market.

In the wet season the Lake must present a beautiful appearance, with its thousand black and green islets, its dark waters, and its deep green herbage of water palms, plantains, and other aquatic and tropical plants. But in this, the last of the dry season, the predominance of pitch, the forests charred by the last year's fires, and the neighboring dusky workmen bathing, gave the scene a *sombre*, though vastly interesting appearance.

From the west border I crossed by wading the narrow *friths* to the eastern, and there noticed the wide depression of its rim, and the great overflow in a wide, deep black mass, now and then obscured by vegetation, flowing on to the bay, distant a mile or more. The appearance at this point, and on to the sea, is that of a black, viscid glacier, suddenly chilled, and ceasing to flow. Some writers compare the Lake to the crater of a volcano filled with pitch; and the lava flow to the track of pitch. Down this outflow the road is built. Of course it is naturally paved with pitch. The transportation of many thousand tons of pitch over this road has not much worn it, showing it, even in its natural condition, to be a good paving material.

The pitch at the Lake, when freshly dug, presents the following physical appearance. In color dusky-brown rather than black, vesicular, with large cavities, as if once filled with gas. These vesicles appear on the surface like large blisters, often having apertures. The mass is yielding to the tread, and soft to pressure. It tastes gritty, and crumbles easily under the teeth. It is entirely innocent of the peculiar taste of bitumen in its natural condition; not so when it is boiled. It then becomes spicy, sweet, having the peculiar taste of bitumen, and is elastic.

Pitch is prepared for market by boiling 24 hours, straining, and then running into barrels, or iron forms. Dr. FIELD's company has two sets of boilers in constant operation, and is producing more marketable product than all the other establishments. As an article for paving it is now looming into large importance. For this purpose it appears to be unequalled.

It is here stored up in large magazines for future use. The area of the Lake is 102 acres (114 by survey—H. W.), and the depth, as ascertained by boring is 800 feet. Its circular form, and its location on the top of La Brea Point, as well as its great depth, give rise to the common opinion that it is the crater of an extinct volcano that is now filled with pitch, and which we call a lake. For gas it seems of equally great importance. Its richness of carbon—if the due proportion of hydrogen can be equally as cheaply supplied, seems to fit it as especially adapted to gas establishments. There is no other point on the globe where the same amount of carbon is stored, so accessible to the sea for transportation.

Dr. FIELD's new establishment has all the elements of Yankee thrift and enterprise. A few months ago he suffered loss of all his works by fire. While yet the flames were rolling upwards, his workmen were in the woods felling timber for the new and larger works. From the ashes, still hot, of the burnt buildings, arose the well ordered establishment of the new ones.

If pitch covers all the aspect of La Brea, it does not hide the hospitality of the genial Doctor. A hot lunch of boiled eggs, toast, and coffee, not forgetting a cold brew (and the Doctor knows how to brew), welcomed his brother of the quondam medical profession, who was bound for the gold fields of El Dorado, in Guayana.

R. P. STEVENS.

[Dr. STEVENS is certainly correct in his suggestion as to the value of this vast deposit of hydrocarbonaceous material, as a source of light. Still, it is a subject for experiment, at least to find the proper mode of application. It is to be hoped that, although European chemists appear to have failed thus far in this applica

tion, we Yankees may, nevertheless, soon work out the right way of using the Trinidad pitch in gas-making.

H. W.]

[By the same mail that brought the above, the following note was received, which we are allowed by the recipient to copy.—H. W.]

CIUDAD BOLIVAR, June 30, 1870.

My Dear Professor: My advent into the tropics is, as usual, attended by some important physical phenomenon. Why nature should be thus moved by the arrival of a denizen of Room 37, does not appear. [On a former trip Dr. STEVENS encountered the great tidal wave, by which a United States war steamer was swept far inland, on one of the islands; an event which must be fresh in the memory of our readers.—H. W.]

To feel the solid earth moved by your coming, would seem to argue some congratulations at your presence. In my case, when they assume the form of earthquakes that shake the earth from under your feet, may be pleasantly dispensed with; I like not such. The earthquake of June 9th was felt all over Guayana, so far as heard from: as well as the neighboring islands of the West Indies.

At Port of Spain we felt it at precisely 8 P. M. In this city it was felt at 8.5 P.M., which, as the wave moves at the rate of twenty-five miles per second, would give, allowing for difference of time-pieces, the focus of the moving force to the eastward, out at sea. Bolivar is 2 deg. 25 sec. west of Port of Spain.

There were no noticeable meteorological changes through the day; barometer 30 in. with frequent showers had been the rule for several days previous to the 9th, as well as on that day, up to the shock. The day following we had a change to dry and pleasant weather, with barometer still at 30 in. Within the tropics there is but small and trivial change of pressure attending showers, or even heavy rains. There are none of those marked changes which we experience in our latitudes.

The mines continue to yield largely of gold. The last report of the American Company gives 11,225 oz. of gold for eleven months run of mill; a little over 1000 per month. One of our new mills, Sperry hopes to get in operation within two months: I give him three. His location is a good one; within the limits of the village of New Providence, near Caratal. Sperry has suffered some from the mining fever, but is now convalescent. My own health was never better; my passage out pleasant and sunny, without the usual allowance of ipecac. My compliments to the Governor, and all who inquires. To the members of the Lyceum also, I remember them weekly on Monday evenings. To Prof. WURTZ I send a notice of Pitch Lake, for his paper. Send all my letters in envelope to GEROLD & ULRICH, Trinidad, on the 22nd of each month, *via* Brazilian steamer.

We are now having the summer of St. John, and I shall tarry in this city until I obtain my mules, and make preliminary arrangements. Yours truly,

R. P. STEVENS.

ON COAL MINING IN DEEP WORKINGS.

BY MR. EMERSON BAINBRIDGE, STUDENT INST. CIV. ENG.

(Condensed from the London *Mining Journal* of May 28, 1870.)

Judging from the statistics of the past few years, the production of the British coal fields could not be considered to increase annually in a constantly increasing ratio, as has been surmised, but might be estimated at an average output of 105 millions of tons yearly. Estimating the coal remaining in the British Islands to a depth of 4000 feet to be 87,300 millions of tons, this quantity of coal would supply the annual demand of 105 millions for 355 years; and, taking the limit to deep mining to be a depth from the surface of 7000 feet, the further quantity of coal estimated to be workable to this depth was 57,222 millions of tons, which would extend the supply for a further period of 535 years.

Deep mining has been carried on much more extensively in Belgium than in England, there being only twelve pits of a greater depth than 1500 ft. in the latter country, as compared with 68 in the former. The deepest coal mine in the world was probably that of Simon Lambert, in Belgium, which had attained the great depth of 3489 feet. The deepest coal mine in England was the Rosebridge Colliery, in Lancashire, which had reached a depth of 2418 ft., the temperature of the coal at that depth being 93.5 deg. The distance from the surface of the ground to the stratum of invariable temperature might be taken at 60 feet, and the constant temperature at that depth at 50 deg.

On comparing the experiments made at the two deepest English coal mines—Rosebridge and Dukinfield—it was found that the increase of temperature due to depth was much less rapid at the latter colliery than at the former; and this difference was assumed in a paper read recently by Mr Hull, to be due to an amount of heat being lost at Dukinfield, owing to the heavy inclination of the strata, which was about 1 in 3, whilst at Rosebridge the coal seam was nearly level.

The highest temperature at which coal mines were worked was probably in Staffordshire and at the Monkwearmouth Colliery, where the temperatures varied from 80 deg. to 85 deg. At the Clifford Tin Mine, in Cornwall, the temperature was 120 deg., in which the miners could only work for 25 minutes consecutively, this high temperature being due to the heat of the water issuing from the rock. Assuming the rate of increase in temperature to be as previously estimated, the normal temperature of a mine 7000 ft. deep would be 176 deg.

The effect of the heat emitted by workmen, candles, explosion of gunpowder, etc, was estimated not to have any appreciable influence on the temperature of the air circulating in the mine. The experiments at Seanam showed the temperature of the return air to be 0.5 deg. *lower* when the mine was in full operation than when the pit was off work, and when no lamps, workmen, etc, were in the workings. An unexplained cause of high temperature had been observed at several collieries, but more particularly at Monkwearmouth, where the temperature of the air on one occasion was found to be 95 deg., or upwards of 10 deg. higher than the normal temperture of the mineral. The question as to the effect of pressure upon deep workings was unquestionably of great importance, and necessarily very speculative.

The employment of machinery in place of manual labor would, probably, be found very beneficial in cutting and breaking down coal in deep mines having a high temperature. Some of the coal-cutting machines now at work were driven by compressed air, and the sudden decrease in temperature which compressed air underwent on exhaustion has been thought likely to be of use in reducing the temperature of a mine, In reality, however, scarcely any reduction could be anticipated, since the quantity of air exhausted bore so small a proportion to an ordinary current of air, that the effect on the temperature was only to be observed locally, and to a very slight degree.

Finally, it might be stated that the question of working coal at greater depths than had hitherto been attained could not be considered to be one which required immediate consideration. The author had endeavored to prove that coal could be worked at a depth of 7000 feet, but it would probably be centuries before such a sinking would be required, and improvements in the various descriptions of mining machinery, especially such as were intended to facilitate the getting of coal, would possibly before long render mining to such a depth as practicable as the workings of deep mines of the present day. Commercially, as had been observed, the question would adjust itself to the requirements and expenditure of the times.

On Setting and Working Retorts.

At the seventh annual general meeting of the British Association of Gas Managers, held in London, June 7, Mr. CATHELS read the following paper, "On Setting and Working Retorts":

"On the proper mode of setting the retorts the prosperity of a gas-light establishment mainly depends." Thus wrote Mr. Peckstone, in his treatise on the manufacture of gas, thirty years ago, and even now, after the additional experience of all that time, Mr. Peckstone's penetrative assertion is as applicable as ever; for in the somewhat multifarious duties of a gas manager there are certainly none more important than the setting and working of the retorts. When it is borne in mind that the expenses directly connected with this part of the process of manufacture, viz., coals, and labor carbonizing them, fuel, and retorts, absorb on an average from 60 to 75 per cent. of the whole cost of manufacture and distribution, and that the amount of each of these items depends to a considerable extent on the attention given to, and the degree of skill exercised in the retort-house arrangements, the necessity for a manager being thoroughly efficient in this essential part of his duties is sufficiently obvious. Indeed, I think it may be accepted as an axiom, that (other things being equal) as are the retort-house qualifications of the manager, so will be the success of the concern with which he is connected. But whether this be agreed with or not, the question is, at any rate, of sufficient importance to engage profitably the attention of this association.

I shall not presume to occupy the time of the meeting by attempting to enumerate the difficulties experienced with the retorts in the early days of gas-lighting, owing to the inconvenient modes at first practised of setting them, before the method was ultimately adopted of placing them horizontally in arches or ovens, or of the various fantastic and more or less impracticable schemes that have since those days from time to time been proposed, or tried and abandoned; because the ingenuity displayed in this direction—sometimes with valuable results, but far oftener otherwise—is pretty familiar to all of us, and is, at any rate, beside the purpose of the few observations here offered, which are to briefly bring the subject before the meeting, with the object chiefly of eliciting the views of such of the members as may favor the meeting with their experiences, so that instruction and benefit may result from the discussion thus provoked.

Cast iron was at first the only material available for retorts, but their rapid destruction, from being exposed unprotected to the direct action of the fire, must have been such a costly matter, that the necessity of protecting them in some way seems soon to have forced itself on those engaged in struggling to overcome the difficulties incidental to this entirely new branch of industry.

Fire-clay tiles were then introduced with great advantage as guards for the retorts, and the number of retorts in a setting or bed was gradually increased to five, which seems to have been generally regarded as the most advantageous. From fire-clay bricks and lumps being used in setting the retorts, the next thing that was likely to suggest itself was the building the retort itself of these materials. And this decided step in advance was taken by Mr. Grafton in the construction of his fire-clay oven, patented just half a century ago. But the substitution of fire-clay for iron retorts was but a slow and gradual process. Nor is this to be wondered at when it is considered that iron retorts, although a costly item, through their requiring to be frequently renewed, had the immense advantage over those of fire-clay, of being absolutely gas-tight, which the latter in their then comparatively imperfect state of manufacture were far from being. And the irons had the further advantage of not filling up with carbon to anything like the same extent as the clays, consequent on their porosity, roughness of finish, and the head of water against which they had to work for want of an exhausting apparatus. But now, when the pressure is removed by exhaustion, and when the manufacture of clay retorts has attained to such a superior state of finish, the advantages are, I think, wholly and indisputably on their side. As regards first cost, a properly constructed clay setting is less than half that of an iron one of retorts of equal size. The durability of a clay retort is—or ought to be—never less than at least twice that of an iron one; while the fuel account for equal productions of gas is quite as favorable with clay as with iron settings. The life of iron retorts, when worked at a proper temperature, may be taken at about ten to twelve months. By working with low heats they might be made to last a few months longer, but the additional longevity obtained would be at the expense of their usefulness. They would make no more gas—and I will venture to say no better gas—in the longer than in the shorter time with better heats and heavier charges. I have been favored with the results of iron settings in a well-managed works—the manager being a member of this association—where iron retorts were used until within the last few years. The settings were five D retorts 20 inches wide by 12½ inches high, and 8 feet long in a bed, They were set on as good a principle, I think, as could have been adopted, and were altogether a very favorable specimen of iron settings. The total average production of each retort was a little under a million and a half cubic feet, but if we take the production in round numbers at that quantity, we shall have, I believe, iron settings working under the most favorable conditions, and with the best results; because less than two-thirds of that quantity has been generally found to be the extent of their productive power. In addition to the rapid perishability of iron retorts at temperatures that do not injuriously affect clay ones, there used to be the further disadvantage—especially in the case of the width of the retort being larger in proportion to its height—of the crown "dropping in;" but this evil has been obviated, I understand, by the strengthening ribs introduced a few years ago by Mr. Fraser, of Colchester, and iron retorts so improved have since their introduction been, I am informed, used to a considerable extent both at home and abroad.

But although the almost universal experience of the gas world has emphatically pronounced against iron retorts, as set in the usual way by themselves (except in some few special cases, such as very small works, where the retort cannot be charged regularly, or kept at a uniform heat, and where, therefore, iron ones are perhaps more suitable than those of clay), they have for many years been used in combination with clays; sometimes in the same arch or oven with the clays, and in other instances set by themselves in a separate arch, but always arranged for the clays to receive the first of the heat. In this application the iron retorts are not usually protected by any covering, and if the principle be not carried too far—that is, if the number of iron retorts be not out of proportion to the clays—they may be entirely heated, or at any rate materially assisted, by the waste or partly spent heat, after leaving the clays, and before passing to the main flue. In these settings the irons require to be so arranged that their outside surfaces can be cleaned with facility, and this I found, from seven to eight years experience of the

system, requires to be done about once a week. This combination seems to have been first adopted by the late Mr. George Lowe, who, according to the drawing in "Clegg," had the two bottom retorts of iron in a bed of five, the other three being of clay. The retorts were so set that the irons could be renewed without disturbing the clays. Messrs. Robinson, of Leicester, appear to have worked a somewhat similar system for many years, their arrangement being a bed of six D retorts, the two top ones only being clay, and the other four iron, the sides of the irons next the furnaces being protected in the usual way of ordinary iron settings. There appears from the drawing (also given in the last edition of "Clegg") to be the same facility for renewing the irons without interfering with the clays, as in Mr. Lowe's arrangement. But in this case the number of iron retorts are so disproportionate to the clay ones, that the spent heat of what would be sufficient for the latter alone, can have but an inappreciable effect in heating them. They otherwise, too, so closely resemble an ordinary setting of iron retorts as to be fairly regardable as such, rather than a combination of iron with clay retorts, as usually understood, for the purpose of utilizing the waste heat from the clays. Mr. Croll also, as is well known, worked a combination of clay and iron retorts, which he patented so far back as 1844. He had three different arrangements to suit works of different sizes. The arrangement for the smallest sized class of works for which the combination was suitable, consisted of four or five retorts set in a six feet wide arch. The furnace was placed at one side, over which there were two clay retorts, through which the heat first played, and was then drawn down through two or three iron ones, and passed to the main flue by a flue under the bottom retort. To suit the next larger class of works there were nine retorts, viz., four clays and five irons, set in an arch about 11 feet high, the clays being all above the irons, and worked from one floor level (in which the furnace was set), while the irons were worked from a lower floor at the back of the arch, the mouthpieces of the clays being at the front, and of the irons at the back of the arch. The heat, after leaving the clays, passed down through the irons to the main flue, under the floor of the arch. The system again for the largest class of works, as is well known from the publicity given to it at the time of the establishment of the Great Central Gas-Works, and the extensive application of it both there and at the Surrey Consumers Gas Works, during the time of Mr. Croll's connexion with both concerns, was the double arch with stage system, except that the lower arch was set with iron retorts instead of being empty, and merely carrying the arch and retorts above, as in the ordinary application of the stage principle. The furnace was on the stage line in the usual way, and like the modifications already described, the gases generated in the furnace, after playing through six or seven clay retorts, descended through nostrils in the crown of the lower arch, and then through seven or eight iron retorts, finally passing under two or more of the bottom retorts to the main flue, placed in this, as in the other cases, under the bench. In each case the clay retorts were circular in section, and 15 inches in diameter, and the iron ones were of the D shape, 12½ inches by 12½ inches, and set without any protecting tiles, to enable them to get the full benefit of the partly spent heat. These settings were, in my opinion, open to the same objection as those of Messrs. Robinson, viz., that there were too many iron retorts in proportion to the clays to secure the economy sought, and being through or double-length retorts, there was not sufficient room for an ascension-pipe at both ends of each retort, involving the serious objection of causing the gas generated near the end, without the exit-pipe, to pass along the whole length of the retort before escaping. There was also the further objection of not being able to separate the clay from the iron bed, so that the letting down of the irons required the clays to be let down too.

Mr. George Anderson's applications of the combined principle have certainly been the most successful, the reason chiefly being, in my opinion, that he subordinates the iron retorts to the clay. The number of irons are but half those of clay, instead of being an equal or even greater number, as in Mr. Croll's system. There is also in each of his modifications the power of shutting off the iron retorts, when required, with facility, by merely altering the dampers of the iron and clay beds. For the smallest sized works, three retorts are set over each other in a narrow arch, so arranged that only two or all the three can be worked as required. For larger works the arrangement consists of setting nine retorts in an arch from 7 feet 6 inches to 8 feet 6 inches wide, according to the size of the retorts. The six retorts that surround the furnace are of clay, the remaining three, placed at one side of the arch, being of iron. The heat from the furnace acts first on the clays and then on the irons, in the usual way of such combination. For the largest sized works again, the retorts are set in three separate but adjoining ovens, the two outside ones being set with clay retorts, and having a furnace each (one of which is usually, though not necessarily, a tar fire), and the middle one with irons without a furnace. Each bed is provided with a separate flue, which enables the bed of irons to be heated or not as desired.

I, also, for some years worked an arrangement whereby the waste heat of each bed of seven clay retorts passed through, among, and effectually heated the retorts in an adjoining oven without a furnace, containing three retorts placed over each other. This oven was 30 inches wide, and was at first set with three iron retorts of the D shape, 15 by 13 inches, with rounded corners, the bottom one being set on a close floor of fire-tiles, and each of the upper two simply carried by four 12-inch wide tiles, placed at equal distances apart, and supported by corbels springing from the side walls of the oven. But it was found the bottom retort burned out before the other two, notwithstanding its being protected by the fire-tiles. A clay retort was, therefore, set in the bottom instead, the upper two only being of iron. As there was a direct communication from each bed of clays with the main flue, in addition to that with the bed of irons, it was only necessary to shut the damper of the iron, and open that of the clay setting, in order to shut the bed of irons off. The arrangement worked very satisfactorily, but the gentleman who has now charge of the works in which I had these double settings erected, has considered it better to dispense altogether with the iron retorts, and to substitute clay ones, still heating them from the adjoining bed. He informs me that he has no difficulty with them.

The important question of utilizing the waste heat from clay retorts by means of blank iron settings, is one I am not prepared to argue very strongly one way or the other. There are so many things to be taken into consideration, that what might be the proper course to adopt in one place, and under one set of circumstances, might be injudicious if carried out in another place, and under totally different conditions. The question resolves itself into whether the value of the fuel saved outweighs the loss of the somewhat diminished production of gas in the iron retorts, and the cost of their more frequent renewal. But in estimating the relative costs, the greater durability of iron retorts in this arrangement than when set over a fire, owing to the absence of cutting draughts, must not be lost sight of. My opinion is that where the demand for coke is good, and the price per ton obtainable averages, say, not less than three-fourths the cost per ton of coal carbonized, iron retorts may be used advantageously, combined with those of clay, as set in the ordinary and often imperfect way. This advantage would hold good to a greater degree, I think, when the retorts happen to be built of bricks, and more so still where brick ovens are used. Wherever this combination is adopted there is an entire absence of flame from the chimney top, which is too frequently to be seen on a winter night from gas-works chimneys, often resembling more a smelting-furnace than what a retort-house chimney should be, and representing, one is afraid to say, what value of fuel is utterly and literally thrown to the winds.

But when the retort-house arrangements are efficiciently conducted, there is, I think, but little need for supplementary iron retorts. If the art of retort setting and working be properly understood, and carried into effect, not only will the spent furnace gases that pass to the chimney be but of inappreciable value, so far as further retort heating is concerned, but the retorts, by obtaining the maximum effect of the heat generated in the best possible way, will produce a great deal more gas during the time they are in action than is usually obtained, with a very important saving over the average fuel accounts.

But whether the spent heat from good clay settings be sufficient or not for heating iron retorts, it is at any rate amply sufficient for generating steam, where there are, say, four or five beds in action. Utilizing it thus is no new idea, but I am not aware that the application has ever been so entirely successful as Mr. Upward, of the Chartered Gas Company, has made it. That gentleman has employed the system in several places very successfully. The arrangement is perfectly simple and manageable, and could be advantageously adopted even in small works, because the want of sufficient heat during the summer months would be no inconvenience, steam not being then required; but in the winter time when it is needed, the greater number of retorts in action would supply the required heat.

[To be continued.]

Small quantities of glycerine are added to paper stock to give the paper greater flexibility, but especially to give copying paper the quality of taking up color readily.

Mr. Bell has found that in working with large masses of sodium, the metal may be melted and run in full exposure to the atmosphere, without any considerable loss by oxidation.

A London despatch says that the "anticipated reduction" of the duties on iron by the United States causes great activity in the iron regions of Wales.

The Chemical History of a Candle.

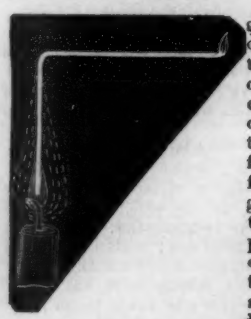
BY PROFESSOR FARADAY.

[A course of Six Lectures delivered before the ROYAL INSTITUTION of Great Britain.]

LECTURE II.

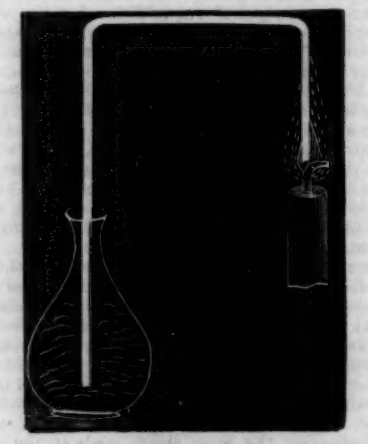
A CANDLE; BRIGHTNESS OF THE FLAME—AIR NECESSARY FOR COMBUSTION—PRODUCTION OF WATER.

We were occupied, the last time we met, in considering the general character and arrangement as regards the fluid portion of a candle, and the way in which that fluid got into the place of combustion. You see, when we have a candle fairly burning in a regular, steady atmosphere, it will have a shape something like the one shown in the diagram, and looking pretty uniform, although very curious in its character. And, now I have to ask your attention to the means by which we are able to ascertain what happens in any particular part of the flame; why it happens; what it does in happening; and where, after all, the whole candle goes to; because, as you know very well, a candle being brought before us and burned, disappears if properly burned, without the least trace of dirt in the candlestick—and this is a very curious circumstance. Now, in order to examine this candle carefully, I have arranged certain apparatus, the use of which you shall see as I go on. Here is a candle; I am about to put the end of this glass tube into the middle of it—into that part which old Hooker has represented in the diagram as being rather dark, and which you can see at any time if you will look at a candle carefully, without blowing it about. We will examine this dark part first.



Now I take this bent glass tube, and introduce one end into that part of the flame, and you see at once that something is coming from the flame, out at the other end of the tube; and if I put a flask there, and leave it for a little while, you will gradually see that something from the middle part of the flame is drawn out and goes through the tube and into that flask, and there behaves very differently from what it does in the open air. It not only escapes from the end of the tube, but falls down to the bottom of the flask, like a heavy substance, as indeed it is. We find that this is the wax of the candle converted into a vaporous fluid—not a gas. You must learn the difference between a gas and a vapor; a gas remains permanent—a vapor is something that will condense.

If you blow out a candle, you perceive a very nasty smell consequent on the condensation of this vapor. This is very different from what you have outside the flame; and in order to make it more clear to you, I am about to produce and set fire to a larger portion of this vapor—for what we have in a small way in a candle, to understand thoroughly, we must, as philosophers, produce in a larger way if needful, that we may examine the different parts. And, now, Mr. Anderson will give me a source of heat; and I am about to show you what vapor is. Now, here is a glass flask, and I am going to make it hot, as the inside of the candle flame is hot, and the matter about the wick is hot.



[The lecturer placed some pieces of wax in a glass flask and heated them over a lamp.] Now, I dare say, that is hot enough for me. You see that the wax I put in it has become fluid and there is a little smoke coming from it.

we shall very soon have the vapor rising up. I will make it still hotter, and now we get more of it, so that I can actually pour the vapor out of the flask into that basin, and set it on fire there. This, then, is exactly the same kind of vapor as we have in the middle of the candle; and that you may see that that is the case, let us try whether we have not got here, in this flask, a real combustible vapor out of the middle of the candle—[taking the flask into which the tube from the candle proceeded, and introducing a lighted taper.] See how it burns. Now this is the very vapor from the middle of the candle, produced by its own heat; and that is one of the first things you have to consider with respect to the progress of the wax in the process of combustion, and as regards the changes it undergoes. I will arrange another tube carefully in the flame, and I should not wonder if we were able by a little care, to get that vapor to pass through the tube to the other extremity, where we will light it and obtain absolutely the flame of the candle at a place different from it. Now look at that. Is not that a very pretty experiment? Talk about laying on gas—why, we can actually lay on a candle! and you see from this that there are clearly two different kinds of action—one the *production* of the vapor, and the other the *combustion* of it—both of which take place in particular parts of the candle.

I shall get no vapor from that part that is already burnt. If I raise the tube to the upper part of the flame, so soon as the vapor has been swept out, what comes away will no longer be combustible; it is already burned How burned? Why burned thus: In the middle of the flame where the wick is, there is this combustible vapor; on the outside of the flame is the air which we shall find necessary for the burning of the candle; between the two, intense chemical action takes place whereby the air and fuel act upon each other, and at the very same time that we obtain light the vapor inside is destroyed. If you examine where the heat of a candle is, you will find it very curiously arranged. Suppose I take this candle and hold a piece of paper close upon the flame, where is the heat of that flame? Do you not see that it is not in the inside? It is in a ring exactly in the place where I told you the chemical action was; and even in my irregular mode of making the experiment, if there is not too much disturbance there will always be a ring. This is a good experiment, for you to make at home. Take a strip of paper, have the air in the room quiet, and put the piece of paper right across the middle of the flame (I must not talk while I make the experiment) and you will find that it is burnt in two places, and when you have tried the experiment once or twice, so as to make it nicely, you will be very interested to see where the heat is, and to find that it is where the air and fuel come together.

This is most important for us as we proceed with our subject. Air is absolutely necessary for combustion; and what is more, I must have you to understand that *fresh* air is necessary, or else we should be imperfect in our reasoning and our experiments. Here is a jar of air, I place it over a candle, and it burns very nicely in it at first, showing that what I have said about it is true; but there will soon be a change. See how the flame is drawing upward, presently fading, and at last going out And going out, why? Not because it wants air merely for the jar is as full now as it was before; but it wants pure air, fresh air. The jar is full of air partly changed, partly not changed; but it does not contain sufficient of the fresh air which is necessary for the combustion of a candle. These are all the points which we, as young chemists, have to gather up; and if we look a little more closely into this kind of action, we shall find certain steps of reasoniug extremely interesting. For instance, here is the oil lamp I showed you—an excellent lamp for our experimnets—the old Argand lamp. I now make it like a candle [obstructing the passage of air into the centre of the flame]; there is the cotton; there is the oil rising up it; and there is the conical flame; it burns poorly because there is a partial restraint of air. I have allowed no air to get to it save round the outside of the flame, and it does not burn well. I cannot admit more air from the outside, because the wick is large; but if, as Argand did so cleverly, I open a passage to the middle of the flame, and so let air come in there, you will see how much more beautifully it burns. If I shut the air off, look how it smokes; and why? We have now some interesting points to study: we have the case of the combustion of a candle; we have the case of a candle being put out by the want of air; and we have now the case of imperfect combustion, and this is to us so interesting, that I want you to understand it as thoroughly as you do the case of a candle burning in the best possible state. I will now make a great flame, because we need the largest possible illustrations. Here is a larger wick [burning turpentine on a ball of cotton]. All these things are the same as candles, after all. If we have larger wicks we must have a larger supply of air, or we shall have less perfect combustion. Look now at this black substance going up into the atmosphere; there is a regular stream of it. I have provided means to carry off the imperfectly-burnt part, lest it should annoy you. Look at the soots that fly off from the flame; see what an imperfect combustion it is, because it cannot get enough air. What, then, is happening? why, certain things which are necessary to the combustion of a candle are absent, and very bad results are accordingly produced; but we see what happens to a candle when it is burnt in a pure and proper state of air. At the time when I showed you this charring by the ring of flame on the one side of the paper, I might also have shown you, by turning to the other side, that the burning of a candle produces the same kind of soot—charcoal or carbon.

But, before I show that, let me explain to you, as it is quite necessary for our purpose, that, though I take a candle and give you, as the general result, its combustion in the form of a flame, we must see whether combustion is always in this shape—when I say "shape I mean condition—or whether there are other conditions of flame; and there are, and they are most important to us. I think perhaps the best illustration of such a point as that, being young ones, is to give you the result of strong contrast. Here is a little gunpowder. You know that gunpowder burns with flame; we may fairly call it flame. It contains carbon and other materials, which altogether cause it to burn with a flame. And here is some pulverized iron, or iron filings. Now, I purpose burning these two things together. I have a little mortar in which I will mix them. (Before I go into these experiments, let me hope that none of you, by trying to repeat them for fun's sake, will do any harm. These things may all be very properly used if we take care, but, without that, much mischief will be done.) Well, then, here is a little gunpowder, which I put at the bottom of that little wooden vessel, and mix the iron filings up with it, my object being to make the gunpowder set fire to the filings and burn them in the air, and thereby show the difference between substances burning with flame and not with flame. Here is the mixture, and when I set fire to it you must watch the combustion, and you will see that it is of two kinds. You will see the gunpowder burning and the filings thrown up. You will see them burning too, but you will see them, burning otherwise than in flame. They will each burn separately. [The lecturer then ignited the mixture.] There is the gunpowder which burns with a flame, and there are the filings; they burn with a different kind of combustion. You see then, these two great distinctions; and upon these differences depend all the beauty and all the utility of flame which we use for the purpose of giving out light. When we use oil, or gas, or candle, for the purpose of illumination, their fitness all depend upon these different kinds of combustion.

There are such curious conditions of flame that it requires some sharpness and some cleverness to distinguish the kinds of combustion one from another. For instance, here is a powder which is very combustible, consisting, as you see, of separate little particles. It is called lycopodium, and each of these particles can produce a vapor and produce its own flame; but, too see them burn, you would think it was all one flame. I will now set fire to a quantity, and you will see the effect. We saw a cloud of flame, apparently in one body; but that rushing sound [referring to the sound produced by the burning] was a proof that the combustion was not a continuous or regular one. This is the lightning of the pantomines, and a very good one too. [The experiment was twice repeated by blowing lycopodium from a glass tube through a spirit flame.] That is not a combustion like that of the filings I have been speaking of, to which I must now bring you back again.

Supposing I take a candle and examine it in that part which appears brightest to our eyes. Why, there I get these black particles which already you have seen three or four times evolved from the flame, and which I am now about to evolve in a different way. I will take this candle and clear away the gutterage which occurs by reason of the currents of air; and if I now arrange a glass tube so as just to dip into this luminous part, as in our first experiment, only higher, you see the result. In place of having the same white vapor that you had before, you will now have a black vapor. There it goes, as black as ink. It is now certainly very different from the white vapor, and when we put a light to it you will find that it does not burn but that it puts the light out. Well these particles, as I said before, are just the smoke of the candle; and this brings to mind that old employment which Dean Swift recommended to servants for their amusement, namely, writing on the ceiling of a room with a candle. But what is that black substance? Why, it is the same carbon which exists in the candle. How comes it out of the candle? It evidently existed in the candle, or else we should not have had it here. And now I want you to follow me in this explanation. You would hardly think that all those substances which fly about London, in the form of soots and blacks, are the very beauty and life of the flame, and which are burned in it as those iron filings were burned here. Here is a piece of wire gauze, which will not let the flame go through it, and I think you will see almost immediately, that when I bring it low enough to touch that part of the flame which is otherwise so bright that it quells and quenches it at once, and allows a volume of smoke to rise up.

[To be continued.]

The Effect of Temperature on Coal Gas.

Of the many experiments which have from time to time been made on the illuminating power of coal gas under different conditions, very few, we believe, have been conducted with a view of ascertaining the extent to which that power is affected by the temperature to which the gas is exposed, and for this reason some experiments of this kind, which were not long ago carried out in the laboratory of the University of Munich, possess a special interest. In these experiments the illuminating power of the gas at the normal temperature of 64½° Fah. was taken as the standard, and the object was to compare, by means of a Bunsen's photometer, this illuminating power with that obtainable when the gas was burnt in the same burner at a higher or lower temperature. In order that this may be done, the burner was attached to a U-tube, which could be immersed either in a cooling mixture, or in a liquid at an elevated temperature. The illuminating power at the normal temperature being represented by 100, it was found that when the U-tube was immersed in snow, so as to bring the temperature of the gas down to 32°, the illuminating power was reduced to from 76 to 85; while when a mixture of salt and snow was used to give a temperature of 4°, the illuminating power of the gas was reduced to from 33 to 40, or, in other words, it was only equal to about one-eighth of that which it possessed at the normal temperature. Of course such a temperature as 4° is one to which gas is never practically exposed, at all events, in this country; but the fact that even at a temperature of 32° there was found to be an average diminution of the illuminating power to the extent of about 20 per cent. is an important one, well deserving of attention.

Heating the gas above its normal temperature was found to have far less influence upon its illuminating power than cooling it below that temperature, and this was a result which might have been expected, for reasons which we shall point out presently. By immersing the U tube in boiling water, and thus raising the temperature of the gas to 212°, it was found that the illuminating power was increased to 104 (the illuminating power at the normal temperature being, as before, represented by 100), while when melted paraffine was substituted for the water, and the temperature thus increased to 288°, the illuminating power became 118. Thus, while a reduction of temperature of about 32° lessened the illuminating power by about 20 per cent., an increase of temperature of 224° raised that power by about 18 per cent only. This state of affairs is readily explicable if we suppose the reduction of temperature in the former case to have been sufficient to cause the liquefaction of a portion of the hydrocarbous associated with the gas, as in that case the total amount of sensible and latent heat abstracted from the gas by the reduction of temperature of 32° might even be greater than that imparted to it when its temperature was raised to 288°. In all the experiments the air for supporting combustion was, we believe, supplied at the normal temperature; but it would have been interesting if, in the case where the gas was cooled to 32° Fah., the light had been supplied with air at that temperature also, and notice taken of the effect.

In the course of the experiments it was found that, after the gas had for some time traversed the tube immersed in the cooling mixture, a thick coating of ice was deposited on the interior of the tube. The water resulting from the melting of this ice had a strong smell, was neutral to test papers, but when exposed to suitable tests gave a feeble reaction, showing the presence of cyanogen. With indigo carmine (snlphin-digotate of potass) and sulphuric acid, it developed the blue color of indigo, and evolved the odor of nitrobenzine To determine the amount of water carried by the gas a large quantity of the latter was caused to pass very slowly through a drying tube charged with pieces of pumice-stone soaked in sulphuric acid. A large number of experiments made in this way, on the ordinary gas supplied to Munich, showed the quantity to average about 1.6 grains per cnbic feet.—*Engineering.*

The Croton Water.

ACTION OF THE DEPARTMENT OF PUBLIC WORKS.

The Department of Public Works, under Commissioner Tweed, is determined to enforce economy in the use of the Croton water. The Water Purveyor in the department estimates that fully fifty million gallons of water are daily wasted in the city, the major portion being at the piers and ferries. Commissioner Tweed has issued the following order to various persons along the river front, and he means that it shall be complied

with. Water meters are being prepared and will speedily be adjusted at all those places where there is reason to suspect any waste, and where the following order is not complied with:

CITY OF NEW YORK,
DEPARTMENT OF PUBLIC WORKS.
COMMISSIONER'S OFFICE, 237 B'WAY.

To the Owner, Lessee, or Occupant:

In consequence of the great waste of water that is daily and nightly occurring along the water front of this city, I am compelled to call your attention to the water fixtures, and to the manner in which the water is used upon your premises. It is estimated that nearly or quite one half of the water brought into the city is literally wasted, doing no one any good. The Department is using all the means in its power to increase the head of water in the lower part of the city, but with the present waste it is impossible to maintain such a head as is desirable by all consumers of water.

This Department feels that it is obliged to require of those having private pipes on the several piers, to attach stop cocks to said pipes, under cover of their offices, and to turn the water off at that point from the pipes on the piers when the water is not required, or used for the purposes for which they have a permit.

You are hereby required to comply with the above directions within ten days from the receipt of this notice.

The Department also informs you that the use of large or fire hydrants for obtaining drinking water is strictly prohibited, and would suggest to you to have a small pipe (not over five-eighths of an inch diameter) connected with your main pipe, put outside the stop-cock in your office, and supplied with a spring faucet that will close itself when not used; to supply drinking water for those employed on the pier during working hours.

WILLIAM M. TWEED,
Commissioner of Public Works.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—EDS.]

Favorable Mention.

HAGERSTOWN, MD., July 3, 1870.

Messrs. Editors: Enclosed please find money order for three dollars for subscription to March, 1871.

You certainly deserve credit for the very able editorial on the "Proper Qualifications for a Gas Engineer." I hope to see it followed by others of the same kind.

Truly yours,
G. C.

'Smedberg's Synopsis of British Gas-Lighting."

MANHATTAN GAS WORKS, N. Y.,
18TH STREET STATION, July 23rd, 1870.

Messrs. Editors: I am pleased to inform you that I have just received a letter from Mr. J. R. Smedberg, dated 1st inst., in which he states that the "Synopsis" is nearly finished, and that it will be of even more value than he expected. The superb monographs on the various phenomena and processes of gas-lighting, and the record of about 1500 patents, will give a spur to American research and progress, which is almost incalculable; and he is every day more satisfied with his task. He will send the matter to D. Van Nostrand in about nine days from the date of his letter.

The interesting papers on the lime and iron processes of purification, retort settings, gasholders (trussed and non-trussed), condensers, etc., written by eminent men, and read at the meetings of the British Association of Gas Managers, will, I think, make it one of the most valuable works ever introduced to the gas fraternity.

Yours respectfully,
WILLIAM FARMER.

The Exhauster Discussion.

KNOXVILLE, TENN., July 22, 1870.

Messrs. Editors: After reading a communication in your last issue, headed "Forewarned, Forearmed! Can Exhausters Draw in Air?" I was led to believe that the working and action of an exhauster is not so well understood among gas men as it ought to be. I will suggest to your correspondent, "F. E. S." a simple method of ascertaining when, and whether the Exhauster is drawing in air, that requires neither a eudiometer or chemicals. Tap the main, *between* the purifiers and holder, and run a half inch, or three-quarter pipe, from there to the engine room; fix on it a common burner, and keep it always burning, in a position where the man in attendance upon the engine and Exhauster can see it. When the Exhauster is going too fast, and consequently drawing in air, the effect upon the light will be an immediate and rapid decrease of the illuminating power. And I am of the opinion that the proper way to run the Exhauster, is just to keep so much back pressure upon the gauge, as will keep the light in the engine-room up to the required standard, say fourteen candles.

There can be no question of the fact, that an Exhauster can draw in air and force it into the holder in any quantity you may desire, as long as the retorts and hydraulic main will stand it. And if there is any danger in running an Exhauster, which I doubt, it does not consist in forming an explosive mixture in the mains, as "F. E. S." states, as the main is the safest place for such a mixture; but it consists in running the Exhauster until it creates a two-inch vacuum in the retorts and hydraulic main. As "Nature abhors a vacuum," of course the air tries every possible means to fill it up, by pressing upon and leaking through the retorts and joints of the mouth-piece, and by still increasing the speed of the Exhauster, a vacuum could be formed, that in Nature's anxiety to fill it up, it might split the retort to pieces in doing so, or at least injure it very much.

Respectfully,
JAS. SOMERVILLE, Sup't Gas Co.

Recent American Patents.

Pertaining to the Specialties of this Journal, from the 2d to the 9th of July, 1870.

104,650.—Steam Water Elevator.—Chas. Rogers, Allegheny City, Pa.

104,659.—Stop-motion For Steam Engines.—John Storer, Peekskill, N. Y. Antedated June 9, 1870.

104,675.—Water Meter.—G. B. Wiggin, South New Market, N. H., assignor to Orville Peckham, trustee, assignor to G. B. Wiggin and J. W. Hoard.

104,723.—Gas Burner.—C. S. Ford (assignor to himself and Charles Young), Philadelphia, Pa.

104,726.—Water Wheel.—Olney Fuller, Bennington, Vt.

104,746.—Rotary Steam Valve.—George Leckenby, Western, Mo.

104,786.—Pump.—P. M. Snell and Oscar Snell, Williamsburg, Ohio.

104,820.—Steam Generator.—William Baxter (assignor to W. D. Russell and P. T. Speer), Newark, N. J.

104,934.—Automatic Water-Elevating Apparatus.—Hugh H. Craigie, N. Y. City. Ante-dated June 29, 1870.

104,950.—Water Meter.—W. M. Fuller, N. Y. City.

104,976.—Water Elevator.—Moses S. McSwain, Pole Grove, Wis.

104,979.—Steam Generator.—Joseph A. Miller, New York City.

105,019.—Apparatus for Generating and Burning Gas.—William Stewart, Steubenville, Ohio.

105,078.—Steam Engine.—John C. Hoadley, Lawrence, Mass.

105,238.—Vapor-Burner.—James Shay, Cincinnati, O., assignor to himself and John Q. Jaynes, Hamilton, Ohio.

105,155.—Low-water Indicator.—Daniel Wiehl, assignor to himself, Peter W. Reinshagen, Andrew P. Lusk, and John H. Buckman, Cincinnati, Ohio.

105,162.—Double-acting Force Pump.—Allen Bagley, Ypsilanti, Mich.

105,181.—Injection for Steam Boilers.—J. P. F. Daticby, Brooklyn, N. Y.

105,190.—Gas Machine.—Joseph. P. Gallagher, St. Louis, Mo.

105,204.—Oscillating Engine.—Thomas Hill, Vallejo, Cal.

105,243.—Steam Generator.—Robert Patterson, Catskill, N. Y.

105,275.—Steam Generator.—G. A. Stone, N. Y. City.

105,289.—Water Regulator and Alarm.—Wm. Wyatt, Nashville, Tenn.

105,305.—Gas Heater.—John E. Cone, Chicago, Ill.

105,350.—Gas Retort.—E. D. McCracken (assignor to himself, Henry J. Newton, Henry B. Kirkland, and Joseph R. Husson), N. Y. City.

105,351.—Manufacture of Illuminating Gas.—Edwin D. McCracken (assignor to himself, Henry J. Newton, Henry B. Kirkland, and Joseph R. Husson), N. Y. City.

105,378.—Carbureting Apparatus.—W. A. Simonds, Boston, assignor to Joel M. Holden, Newton, Mass.

105,397.—Feed-water Heater for Steam Boilers.—Dan. Whitlock, Newark, N. J.

REISSUES.

4,049.—Water Indicator For Boilers.—John D. Lynde. Philadelphia, Pa.—Patent No. 74.389, dated Feb. 11, 1868.

RECENT ENGLISH PATENTS.

[From the LONDON ARTISAN, July 1. 1870.]

1513.—Gas Furnaces.—C. W. Siemens.
1514.—Gas Stoves.—G. Thomas.
1524.—Treatment of Coal Gas.—D. Jones.
1533.—Improvements in Steam Boilers.—W. Arnold and W. Carnelley.
1540.—Steam Generators.—B. J. B. Mills.
1550.—Steam Engines.—J. Cope.
1560.—Exhausting Gas.—W. Cleland.
1634.—Meters.—A. W. Pocock.
1640.—Gas for Illuminating and Heating from Coal Oils—W. Wilson.
1664.—Supplying Coal to Gas Retorts.—J. W. and W. D. Butler and J. Dunbar.
1729.—Gas Meters.—H. H. Kromschroeder and W. P. Randall.
1733.—Gas Burners.—C. Joseph.

Petroleum.

In reference to the yield in Western Pennsylvania, the Titusville *Herald* says that the month of June was not marked by the striking of as many new and productive wells as the month preceding, yet the production was steadily increased during the month, above the decline in many of the old producing districts, and exhibits for the month under review, a gain of about 650 barrels per day. While many of the oil tracks throughout the region exhibit no important change in the yield, several localities show a decline of 50 to 200 barrels per day, while upon others the decrease and increase were such as to maintain an average production in the aggregate, that does not differ essentially from the former reports.

The following table, compiled at the *Herald* office, shows the production during June, 1870:

	Barrels.
Total shipment of crude for June of barrels of 50 gallons each	452,682
Add to reduce to bbls. of 43 gallons each	21,059
Total shipment of bbls. of 43 gallons each	473,841
Stock on hand June 1	351,168
Stock on hand July 1	321,840
Deduct decrease on July 1	29,328
Total production during May	444,513
Average per day for thirty days	14,817
Average per day in June, 1869	10,064
Daily increase June, 1870, over June, 1860	4,753

—*Stockholder.*

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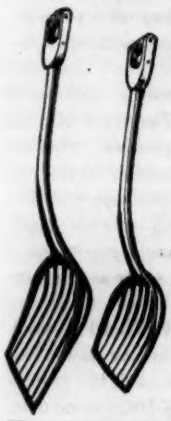

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ORREL COAL COMPANY,

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Mines in Harrison County, West Virginia.
Wharves, Locust Point, } Baltimore.
Company's Office, 29 South street. }
Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.
*** Reference to them is requested. 204-1y

TO PATENTEES AND MANUFACTURERS.

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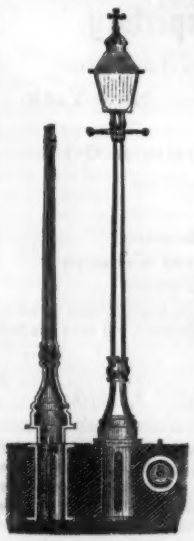
THE ADVANTAGES OF THIS PATENT POST over the old style, are as follows:



1st. The saving of the base or bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather: all this is obviated in this Post, as no digging is required. This style of Pos is especially desirable when flag stone sidewalks are used.

3rd. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes; no digging being required as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

5th. In case a broken column cannot be repaired, one third of the original cost is saved by the base being secured and perfect.

Rights for States, or the United States, on reasonable terms. Address, Editors Gas-Light Journal, 42 Pine street, N. Y.

Certificate.

St. Louis, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post and ordered a large quantity for immediate use.

THOMAS PRATT,
587-6m Sup. St. Louis Gas Works.

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M. L. CALLENDER & CO.,
EDITORS AND PROPRIETORS.

Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

TUESDAY, AUGUST 2, 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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PATENTS.

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GENERAL EDITORIAL.

McMILLIN'S NEW METHOD OF PURIFYING GAS.

Every gas superintendent will uphold us in the assertion, that the lime process of purifying gas, as practised in this country, and for that matter, throughout the civilized world, wherever gas is used, is an *unmitigated nuisance.* It is the *bête noire*, the "bug bear" that haunts the otherwise well regulated gas works, to the manifest scandal and disparagement of the noble art, which contributes more than any other, perhaps, to the necessities, the convenience, and the luxury of the people, and which is the great propagandist of civilization and moral advancement.

Hence it is, that any improvements which will tend to mitigate the evil referred to, will doubtless be of interest to all gas men; but when the improvement is so radical in its nature, which this is, as to almost entirely overcome the inconvenience, and disagreeabilities, and greatly lessen the labor of the process of purification as now practiced, we are confident the fraternity will examine it with unusual attention, and gladly avail themselves of its benefits.

HISTORY AND NATURE OF THE INVENTION.

Mr. Emerson McMillin, the inventor of this valuable improvement, is the Superintendent of the Ironton Gas Works, Ironton, Ohio; a gentleman of intelligence, and an Engineer of much practical experience.

The material employed by Mr. McMillin is the grind-stone dust from factories, where iron and steel tools, etc., are ground. The reasoning by which he arrived at the conclusion that such material would purify gas, was purely inductive, and not by accident or chance. By a series of persevering experiments, he followed out the ingenious reasoning he had laid down, and eventually developed the improvement which made certain properties of grind-stone dust available, as they now are, for the purpose of gas purification.

This dust is a mixture of microscopic particles of silicic acid and iron, intimately mixed. Owing to the very minute division of the iron particles, they offer the largest attainable surface to the action of the gas, compared with the amount of iron employed. Theoretically, the particles of silicic acid alternating with the particles of iron, make a series of galvanic circles, which, when moisture is persent, develop an electric action, that favors and promotes the union of the sulphur of the gas with the surfaces of the iron particles, forming a thin coating of sulphate of iron, which envelopes each particle.

The dust remains porous throughout, because it is a mixture of heterogeneous particles of iron and stone dust, having no chemical affinity, neither have they any mechanical or cohesive attraction one for another; consequently the gas passes through readily and permeates it thoroughly at all times. Owing to this peculiar property, there requires to be no labor expended in breaking up lumps, or overhauling the material when it is once in use.

The grind-stone dust is sometimes mixed with clay, and dry lime, or loam; this serves to absorb the ammonia and the carbonic acid of the gas.

This material is placed on all the trays, except the bottom trays. On the alternate bottom trays is placed lime, on the other bottom trays clay. The lime and clay each answer a double purpose. The lime in the bottom arrests any tarry matter, which otherwise might interfere with the process of oxydation, and also absorbs the carbonic acid. The clay also arrests any tarry matter, and at the same time absorbs the ammonia.

This material will purify 10,000 cubic feet of gas to the bushel. The material is not necessarily removed from the purifiers when it has been used. The purifier may be so arranged that the gas can be shut off, and a current of hot air passed through it, which revivifies or oxydizes the iron, and drives off the impurities from the other materials, leaving the contents of the purifiers ready for use again.

In the use of oxide of iron for purifying gas as heretofore practised, it is well known the great difficulty in the process is, that after using a short time the material becomes homogenous throughout, adheres, and cakes together in compact masses, so that gas cannot pass through it freely; consequently it requires much labor and expense to pulverize and prepare it for use a second time.

In the use of iron turnings, borings, etc., the difficulty has been, that the size of the pieces of iron was so great, that little surface was exposed to the action of the gas, and the interstices were so large, that much of the gas passed through, without coming in contact with the iron at all.

Both these difficulties are abated in the use of McMillin's purifying material. The oxide of iron and turnings, etc., are both expensive; whereas grind-stone dust is a waste material, having at present no commercial value, and the supply of it is ample to meet all demands, as will be understood, when it is considered that when each gas-works is once stocked the demand ceases, so far as it is concerned.

In practice, when a fair quality of coal is used, and proper heats employed, no lime or clay is required. Where lime and clay are used, the proportion is about 1-10th of each, and 8-10ths stone dust.

It cost the Ironton Gas Light Company, in 1869, with the lime process, five and one half cents per 1,000 cubic feet to purify their gas. With this process, using the same coal, it cost one half cent only per 1,000 cubic feet. This includes lime, revivifying, and all expenses connected with the purification of gas. The dust in use has been in use over a year, and it is quite as good now as when first used.

Prof. Thomas G. Wormly, the well known and experienced Gas Commissioner for the State of Ohio, at Columbus, has made the following analysis and given the theory:

"No. 1. (New dust) contains 22.63 per cent. of iron, partly in the form of oxide, but chiefly in the metallic state. This material would, of course, be subject to more or less variation.

No. 2. (Material used for one year but ready to use again,) contains 5.13 per cent. sulphur, a very minute portion of which was in the form of sulphuric acid, much the greater portion being in the free state. This mixture contains *no sulphuret* of iron.

No. 3. (Foul dust from the purifyer) contained sulphuret of iron. Whether or not the whole of the sulphur was in that form, we did not determine. On drying this material in a current of air at 212 deg. Fahrenheit, the *whole* of the *sulphuret* of iron was *decomposed*, the iron being oxidized, and the *sulphur set free*, without evolving any *sulphuretted hydrogen.*"

"The sulphuretted hydrogen in the gas on coming in contact with the oxide of iron, undergoes decomposition with the formation of sulphuret of iron and water thus: — H S + Fe O — Fe S + H O. That the whole of the sulphur unites with the iron I am not prepared to say. On exposing the mixture to the air the iron is oxidized, the sulphur being set free. The carbonic acid present in the gas, is taken up by the lime employed, whilst the *clay used takes up* the *ammonia*; clay has also, the property of decomposing certain compounds of sulphur not previously taken up by the iron."

When the inventor had first developed, and

practically tested his improvement in purification of gas, he communicated the result of his experiments to us, and asked our opinion of its merits and advice, as to the feasibility of getting the process patented. The great value of the invention struck us so forcibly then, that our advice was, to secure a patent, which was immediately done.

We therefore individually, are much gratified by the success of this improvement of Mr. McMillin's, which we understand is gaining much favor, although we have no other interest in it, only as it has a scientific bearing.

Parties desirous of using this process, or getting further information, can do so by addrssing E. McMillin, Ironton, Ohio; or E. S. Funnell, General Agent, Albany, N. Y.

THE "NEWBURGH ORREL" GAS COAL OF WEST VIRGINIA.

We are informed that the gas of the Baltimore Company, from which the following results were obtained by Professor AIKEN (from whom we have the following report direct), at a testing place situated *two miles distant* from the Works, is made exclusively from the above coal.—H. W.

William E. Aiken, inspector of illuminating gas for the city of Baltimore, makes the followiug report for the quarter ending July 2, 1870. The average of the observations on the illuminating power, chemical purity, and pressure of the illuminating gas supplied by the Baltimore Gas-Light Company during the past quarter was as follows:

MONTHS.	Illuminating power in candles.	Pressure in main maximum.	Pressure in main minimum.	Burn'g pressure during trial of gas.	Maximum illuminating power.	Minimum illuminating power.	Temp. of room.
April.....	15.05	3.6	2.2	.2	16.5	13	64°
May.....	16 03	3.6	2.0	.2	17.5	14	65°
June.....	16.07	3.6	1.7	.2	17.5	14	70°
Average..	16.01	3.6	1.9	.2	17.1	13	..

The inspector remarks that the gas during the last quarter, although a trifle lower in illuminating power when compared with the corresponding quarter of last year, has been much above the standard. In chemical purity it has been fully equal and very satisfactory.

SMEDBERG'S "SYNOPSIS OF BRITISH GAS-LIGHTING."

We feel happy to be able to inform subscribers to the above work. that Mr. Smedberg has the "Synopsis of British Gas-Lighting" nearly completed, and in all likelihood it is now on its way, to be placed in the hands of the printer. Mr. S. states that it will be of more value than he expected, and one of the most valuable works ever introduced to the gas fraternity. See letter also on the subject under head of "Correspondence," in another column, received by Mr. Farmer, of the Manhattan Gas Works, in this city.

We are assured that this will be a very complete and valuable work. Certainly, no person we know, is better qualified to compile a work of this nature. It will be a complete *Index Rerum* upon gas matters, and no gas engineer, or other person interested in gas matters, can deem his library complete, without a copy of this work.

We would suggest that all desiring to secure a copy, who have not already subscribed, will find it to their interest to send in their names at once, in order to insure themselves against disappointment, as the edition will be issued only to the amount required for the subscribers.

"HOW GAS MAY BE UNCONSCIOUSLY ADULTERATED.

"The State Gas Inspector of Massachusetts, writing in the AMERICAN GAS-LIGHT Journal, states that when the pressure in gas retorts runs low, atmospheric air is apt to press in, 'because of the difficulty of making or keeping tho joints about the mouthpiece tight.' He quotes figures, results of actual experiments, to prove that in works where gas is drawn directly from the retort air has leaked in, in dangerous quantities. This of course diminishes the illuminating pawer of the gas, and even creates a compound liable to explode in the pipes and mains. If this be so, it is a wonder no instance of such explosion has yet been heard of, in our own or any other country. But if air can leak into the retort, the companies must make money pretty fast while it is being measured as gas at the meters.

"An editorial writer in the same journal speaks highly of a new and patented gas process, now in operation under the auspices of the Citizen's Gas Light Company of Saratoga. It appears to consist in infusing petroleum into the retort, using the half-formed coke as a sponge to absorb it. Thus the gas is made partly from coal and partly from petroleum; and it is claimed to be purer and better, as well as more in quantity than can be made from either substance separately; besides being much cheaper."

The above we clip from the *Brooklyn Eagle* of July 21st, which shows a laudable desire on the part of the *Eagle* to post its numerous and intelligent readers upon the subject of gas manufacture, and any improvements in the same.

The writer sagely and truly remarks in the first paragraph, regarding air being drawn into the retorts, "It is a wonder no instance of such explosion has yet been heard of, in our own or any other country."

The fact is, the conditions necessary to produce an explosive mixture cannot occur in practice, for the reason that the gas would cease to give light, before the dilution had gone to the extent to produce an explosive mixture.

It is a popular error also, to suppose that gas companies can dilute ordinary gas with air, so as to have the increased volume enhance their profits at the expense of the consumers. The introduction of air into standard gas is always to be avoided by the gas companies, because its presence, even in small quantities, so depreciates the standard candle power, as to much more than offset any gain in volume.

The only case in which air can be used is where the materials employed to make gas are so rich in carbon, as to give a gas greatly above standard, that would smoke when burned in the ordinary burners. Such gas is positively improved in illuminating power up to a certain point, by diluting it with air, or with hydrogen (which serves to perfect the combustion), and is a gain to the consumer as well as the manufacturer.

In the last paragraph, in speaking of the new process in manufacturing gas at Saratoga, the writer conveys the idea that petroleum is "infused into a retort" containing coke or coal.

Coke or coal is only used to heat the "bench" or retorts. The petroleum or naphtha is first distilled in a still at a low temperature—the vapor only, is by means of pipes, introduced into the retort, where the higher temperature (a low red heat) converts it instantly and completely into a fixed gas.

A VETO ON GAS BURNERS—IMPROVED GAS PROCESS DESIRED.

The Board of Aldermen of New York City, recently passed an ordinance, authorizing the Commissioner of Public Works to attach to each of the public gas lamps, one of Cremin's patent gas burners, at a cost of *not over* $15. But Mayor Hall has vetoed the ordinance. He thinks it is paying too much for too little, and that improvement in light lies in another direction, namely, in the process of manufacture. If he has this object earnestly in view, we suggest that he visit Saratoga, and examine the new method of mauufacture employed there, known as "Brown & Co.'s process"; 21 candle gas at 40 cents per 1000 cubic feet *is* an improvement, and no mistake.

TROW'S NEW YORK CITY DIRECTORY AND COMMERCIAL REGISTER.—Owing to the fact, that nearly the entire first edition of this Directory was destroyed by fire on the 22nd of June, the second edition has been published in advance of the usual time, and is now ready for delivery. We must say the appearance of the work is very creditable to both the compositer, Mr. Henry Wilson, and the publisher, Mr. John Trow.

The present volume of the Directory contains an increase of 15,174 names over last year's publication, and a considerable increase in its dimensions. Every true business man knows the value of such a work, and will not fail to provide himself with a copy.

We forgot to say that the Commercial Register is also much enlarged, and the list of public institutions, private and public corporations, etc., together with the alphabetical arrangement of the names of the streets and avenues, etc., is full and complete.

GAS CONSUMED IN NEW YORK.—Internal revenue returns of the different gas companies of New York City, for the month of June, foot up as follows:

GAS-LIGHT COMPANIES.	Feet.
Metropolitan Gas-Light Company	30,066,968
Harlem Gas-Light Company	6,936,040
Manhattan Gas-Cight Company	77,849,245
New York Gas-Light Company	45,940,274
Total cubic feet	140,783,526

GAS WORKS ON WARD'S ISLAND.—The Commissioners of Emigration are about to have gas works erected on Ward's Island, and have requested the Ward's Island Committee to procure estimate and probable cost, and report same to the Board.

Answers to Correspondents.

L. L. F., Ithaca, N.Y.—Walter Frost, 19 Mechanic street, Newark, N. J., manufactures the Leffingwell Governor for gas meters, of the size you require.

C. A., of Vt.—Burnt oil may be removed from the brass works of an engine by scouring it first with fine emery and oil, then finishing it with rotten stone

M. A. S. of N. Y.—The compression of air into a cylinder, and the absorption of its heat while in that condition, by water, so as to enable it to absorb heat from water afterwards when it is expanded, and thereby freeze it to produce ice, is a well known process, and not patentable. We do not believe you will be able to manufacture it profitably by this method.

J. D. of Ind.—It would be necessary to know more of the facts you communicate in order to answer your question. How great is the present head? How large is the pipe through which the water flows? and and how much water do you want to reiseper day?

A SUBSCRIBER.—From letters received, we have every reason to believe that the "Synopsis of British Gas-lighting" will very soon be pubished. See editorial, and letter under the head "Correspondence" in this issue of the Journal.

TRINIDAD BITUMEN.

EQUAL TO BOGHEAD CANNEL FOR INCREASING the Illuminating qualities of Gas.
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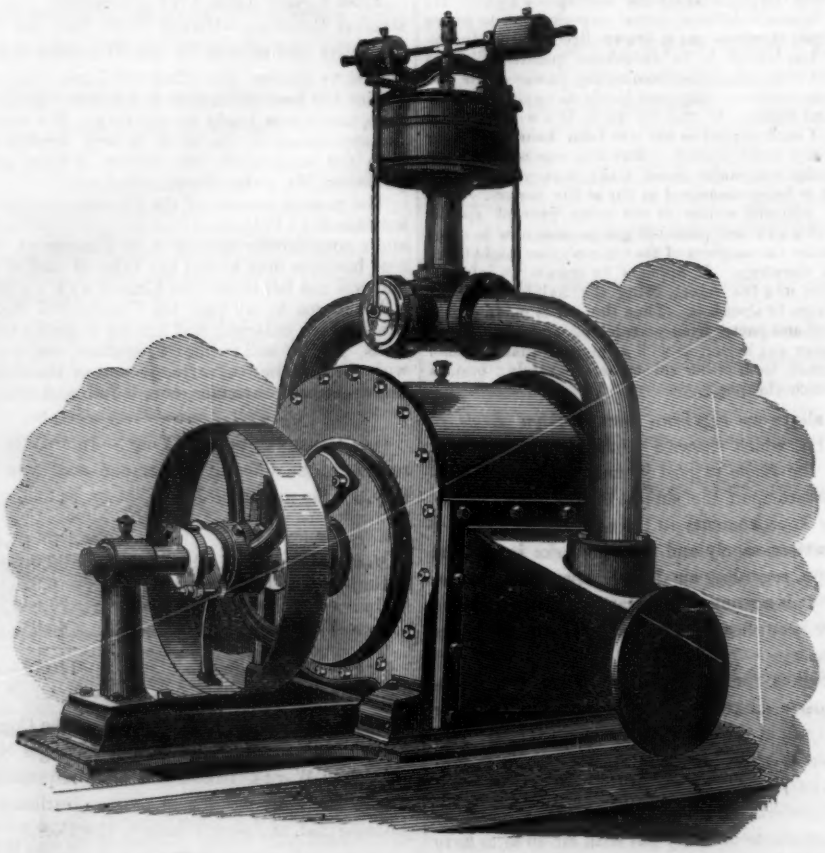
P. O. Box 966. 255-6m

TO GAS COMPANIES.—WANTED BY A Practical Gas Manager, a situation as Manager of a moderate size Gas Works, or Assistant Manager in a large Gas Work. Has had many years experience, and can produce satisfactory references. Address ALEXANDER THOMSON, 35 Elmwood street, Boston, Mass. 255-tf

Smith & Sayre Manufacturing Company.

The Mackenzie Patent Gas Exhauster,
AND PATENT COMPENSATOR.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the produc tion and illuminating power of he gas, and add very much to the durability of the retorts, eitheclay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 ton to 20 ons per hour, will save one quarter of the time required by the old style Cupola, and 38 per cent. fuel. Address

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JAMES SAYRE, Treasurer,

CHARLES W. ISBELL, Secretary Office, 95 Liberty street, New York.

KEYSTONE IRON WORKS,

2132 Filbert Street, Philadelphia.

G. W. KRAFT, PROPRIETOR,

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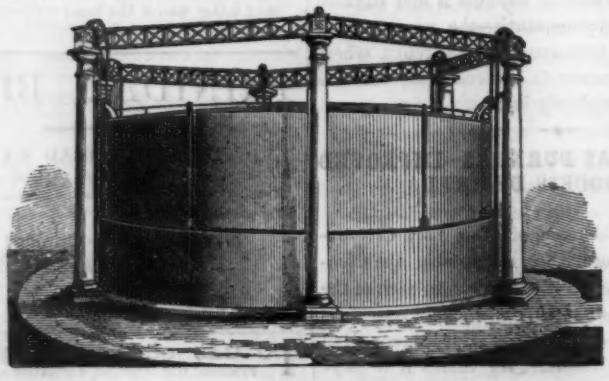

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Make Valves—Double and Single Gate—4-inch to 36 inch, for Water, Gas and Steam.

"CINCINNATI, March, 1870.

"I would say that if any certificate or affidavit is desired in relation to the superior character of the Ludlow Valve above others that I have seen, the same will be cheerfully given. I think, however, that the Valve proves for itself.

"JOSEPH P. MAYER,
"Superintendent Water Works."

"DAYTON, OHIO, June 27, 1870.

"I have to say that we find them always in order—operating easily under all degrees of pressure. In a word, they have given perfect satisfaction in every particular.

"GEORGE LEHMAN,
"Chairman Water Works Committee."

"CANTON, OHIO, June 27, 1870.

"We are now using and have been, since the commencement of our works, your valves, and they are proving entirely satisfactory.

JOHN S. SHORT.
"Superintendent Water Works."

"PEORIA WATER WORKS, July, 1870.

"With pleasure I can testify to their superiority. Their action has been perfect under all degrees of pressure, and have given perfect satisfaction.

"S. A. KINSEY, Ex. Sup't.
"JOHN J. SIBIGER, Sup't."

"BROOKLYN GAS LIGHT COMPANY.

"I take great pleasure in saying that they give perfect satisfaction—opening easily and quickly, and requiring no effort to start them; even after they have been closed for months.

"A. F. HAVENS, Engineer."

"OFFICE OF PHILADELPHIA GAS WORKS, 14th June, 1870.

"I am pleased to state that the lot of large Gas Valves bought from you (Hart & Buck), as agents of the Ludlow Valve Manufacturing Co, have given me perfect satisfaction. The double gate water valve, bought for a special purpose, also works admirably. We want no better valves. The Indicator on your valves is a great improvement over the old style.

"THOS. R. BROWN, Engineer."

J. S. HOBBIE & SON,

SUCCESSORS TO

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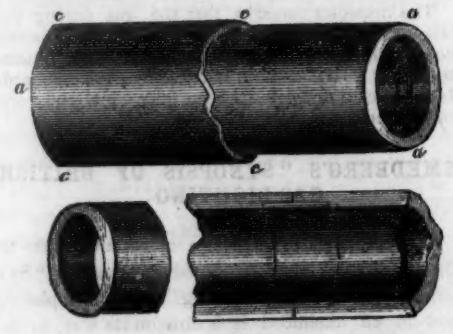
Wooden Water and Gas Pipe.



These Pipes combine

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The Water Pipes are the cheapest and best in use for watering Cities and Villages, conveying water to Railroad Tanks, Distilleries, Breweries, Tanneries, and water courses of every description.

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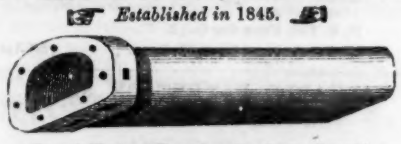

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MISCELLANEA.

A French Chemist, Mr. Hustault, has invented a process for making petroleum inexplosive by mixing with it a small quantity of "amylic alcohol."

Coal in Brazil.—R. Von Brause announces the discovery of a three foot four inch bed of good gas coal, cropping out for 30 miles through the district of Santa Catharina, near Araranguа. Analysis by Dr. Netto of Rio. Tertiary or Cretaceous.

The Professor who undertook to remove the obstructions to navigation in Hell Gate, has abandoned the job half finished. His theories of surface blasting, as any man of common sense could have told him, have proven fallacious.

Gen. G. B. McClellan, and a number of leading iron manufacturers, recently visited Bedford, Pa., for the purpose of examining recent discoveries of iron ore deposits in that vicinity. The establishment of extensive iron manufactories is in contemplation.

At Melbourne, the 15th of February was the hottest day of the season. The thermometer reached 109 degrees in the shade, and there was an overpowering hot wind blowing. Lent, under such circumstances, is truly a penitential season.

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THE GAS MANAGER'S HAND BOOK; consisting of Tables, Rules, and Useful Information for Gas Engineers, Managers, and others engaged in the Manufacture and Distribution of Coal Gas. By Thomas Newbigging; 8vo, cloth. $3.75.

BOWER—Gas Engineer's Book of Reference, illustrated, 4to. Price, 75c.

CLEGG—Treatise on the Manufacture of Coal Gas, 5th edition, enlarged, 4to, cloth. Price, $10.50.

COLBURN—The Gas Works of London, 12mo., boards. Price, 60 cents.

CROLL—Report of the Proceedings on the Arbitration with the Great Central Gas Consumers' Company, 8vo., cloth. Price, $2 50.

HUGHES—Gas Works and Manufacturing Coal Gas, 12mo. Price, $1.50

MASON—The Gasfitters' Guide, paper. Price, 50 cents.

D'HURCOURT—De l'Eclairage du Gaz. Par E. R. Hurcourt 3d edition. Paris, 1868; 8vo. and plates, $7.50.

RICHARD—Gas Consumers' Guide, 12mo., Price, 50 cents.

SWEET—Special Report on Coal, showing its Distribution, Classification, and Cost, delivered over different routes to various points in the State of New York, and the principal cities on the Atlantic Coast. By S. H. Sweet, with Geological Maps. 1 vol. 8vo. cloth, $3.

SUGG—Gas Manipulation, with a description of the various Instruments and Apparatus employed in the Analysis of Coal and Coal Gas, 8vo, cloth. Price, $7.50.

WILKINS—How to Manage Gas, 24mo., paper. Price, 25c.

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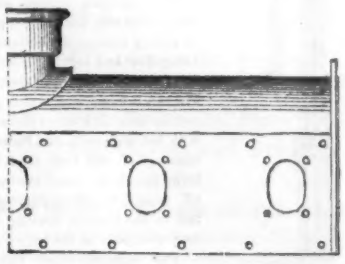

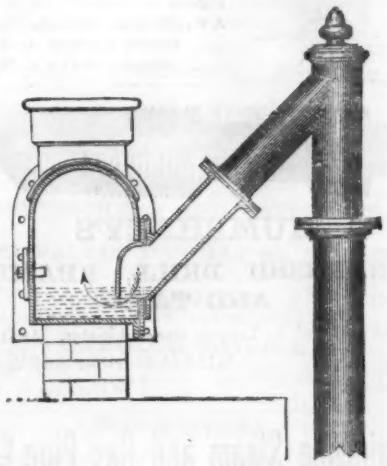

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By the removal of the front plate only the Main can be adopted to Settings of any number of Retorts desired. The Patent Main can be applied to the ordinary D shaped Main. It offers great facilities for cleaning, and is not liable to stoppage.

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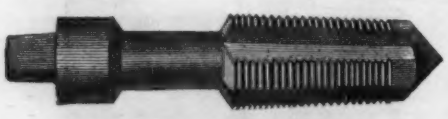
The invention consists mainly in dispensing with the interior gas pipe, by simply closing the bottom of the Lamp Post and tapping it five inches from the bottom for the service pipe. The top is fitted with a plug or stopper to take in a short piece of pipe with the stop-cock and burner. h interior of the Post thus forms a large gas chamber and condenser for all moisture and impurities which fall to the bottom, leaving the gas free and pure at the burner.

For manufacturing rights and rights to use, or other information, address

J. W. GRAHAM, Chillicothe, Ohio, or EDITORS AMERICAN GAS-LIGHT JOURNAL, 42 Pine st., N. Y.



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Providence Steam and Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

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For Towns and Manufactories.

Estimates furnished of the cost of Works, and cost to manufacture Gas in any locality.

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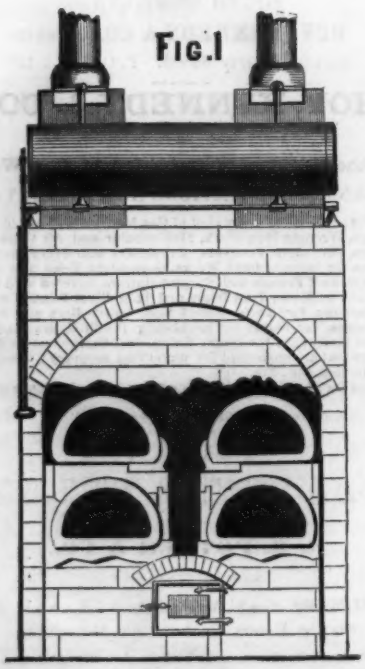

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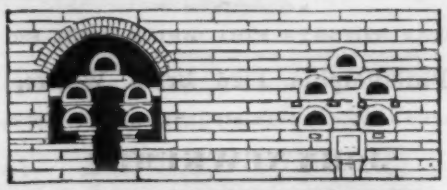

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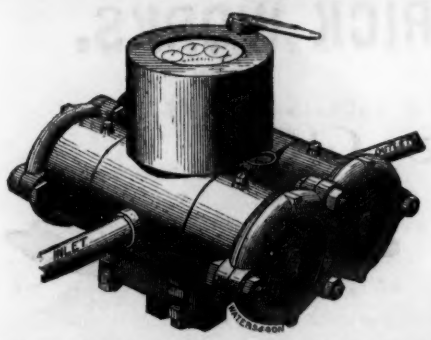

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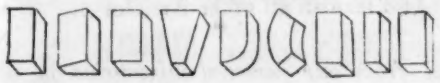

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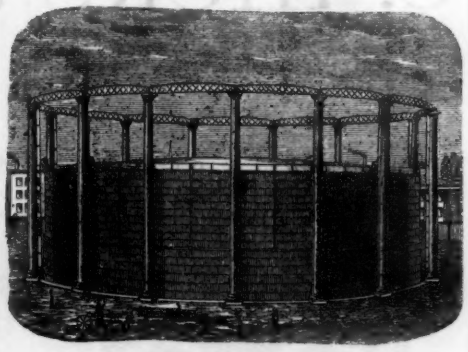

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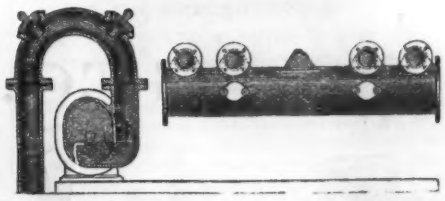

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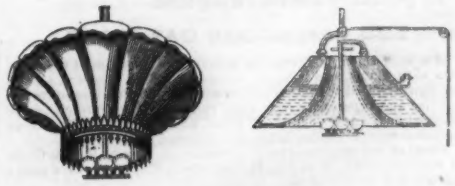

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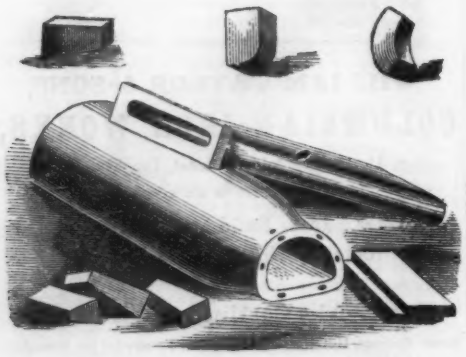

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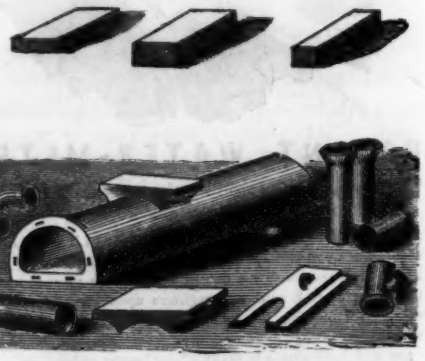

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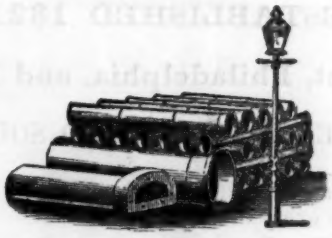

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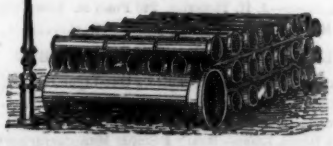

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